Vari-Sweep
Models Radar & IF
1-274

KAY ELECTRIC COMPANY

Vari-Sweep

Models Radar & IF

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TABLE OF CONTENTS

Page

SECTION I, GENERAL DESCRIPTION

A. APPLICATION 1
B. FEATURES 1
C. SPECIFICATIONS 2
D. EQUIPMENT SUPPLIED 2
E. ADDITIONAL EQUIPMENT REQUIRED BUT NOT SUPPLIED 2

SECTION II, INSTALLATION

A. GENERAL 3
B. INTERCONNECTION DATA 3
C. CRYSTAL FREQUENCIES 3

SECTION III, OPERATION

A. IDENTIFICATION OF CONTROLS 6
B. OPERATING PROCEDURE 7

SECTION IV, THEORY OF OPERATION

A. GENERAL 9
B. SAWTOOTH SWEEP CIRCUITS 9
C. SWEEPING OSCILLATOR CIRCUIT 9
D. AGC CONTROL CIRCUITS 9
E. CW OSCILLATOR CIRCUITS 10
F. MARKER CIRCUITS 10

SECTION V, MAINTENANCE

A. TROUBLE LOCATION 11
B. ALIGNMENT & ADJUSTMENT 12

SECTION VI, 200A POWER SUPPLY INSTRUCTIONS

A. DESCRIPTION 12
B. POWER SUPPLY CIRCUIT DETAILS 12
C. MAINTENANCE 13

SECTION VII, PARTS LIST

A. 200A POWER SUPPLY 13
B. FREQUENCY GENERATING CIRCUITS 21

LIST OF ILLUSTRATIONS

Figure *Page*

1. VARI-SWEEP RADAR #865 & IF #866 INTERCONNECTION BLOCK DIAGRAM 4
2. VARI-SWEEP RADAR #865AW INTERCONNECTION BLOCK DIAGRAM 5
3. FUNCTIONAL BLOCK DIAGRAM 8
4. TUBE LOCATION CHART 14
5. 200A POWER SUPPLY SCHEMATIC 15
6. 200A POWER SUPPLY TUBE LOCATION CHART 16
7. VARI-SWEEP MODEL RADAR & IF SCHEMATIC 17, 18
8. VARI-SWEEP MODEL RADAR #865AW SCHEMATIC 19, 20

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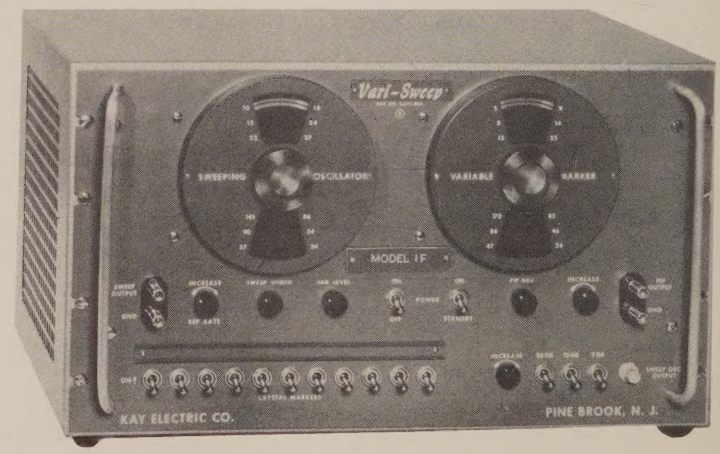
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SECTION I
GENERAL DESCRIPTION

A. APPLICATION.

The **VARI-SWEEPS MODEL RADAR** *cat. #865 & #865AW,* and the **MODEL IF** *cat. #866* are sweeping oscillators and frequency marker generators designed for testing and aligning intermediate frequency circuits. In conjunction with an oscilloscope, they may be used to obtain a pictorial indication of the frequency response characteristics of amplifiers, filters, and similar circuits.

B. FEATURES.

The **VARI-SWEEPS** utilize variable permeability techniques in a completely electronic circuit to generate a linear sweeping output whose center frequency may be set anywhere from 10 to 145 MC in the **MODEL RADAR,** from 4 to 120 MC in the **MODEL IF,** and from 10 to 130 MC in the **MODEL RADAR,** *cat. #865AW.* The sweeping oscillator covers the band in six, switched, overlapping bands with a direct-reading, individually calibrated frequency dial. The fundamental RF output is held constant over the range by a fast-acting AGC circuit.

In the **MODEL RADAR** and **MODEL IF,** for frequencies below 50 MC, the sweep width is continuously variable to at least 60% of the center frequency; above 50 MC, with the sweep width pot at maximum, the minimum sweep width is at least 30 MC. In the **MODEL RADAR,** *cta. #865AW,* the sweep width has been extended to provide a 70 MC wide sweep at 130 MC. In special models wider sweep widths may be provided.

To avoid phasing problems, a single symmetrical sawtooth voltage is used both as a horizontal deflection signal for the oscilloscope and to frequency modulate the sweeping oscillator. To provide a clear, zero-voltage reference line on the scope, the negative portion of the square wave output of *V-2* is used to disable the sweeping oscillator on alternate half cycle operation. A series of variable and switchable attenuators provide a range of amplitude control.

A cathode follower mixing circuit has been incorporated in the design of the **VARI-SWEEP MODEL RADAR,** *cat. #865AW.* It provides for the internal mixing of the detected sweep output with the pip markers, making it unnecessary to use a separate cable connection between the oscilloscope and the pip output. This is desirable is applications where the addition of the pip markers to the scope would load the detected sweep output. As in all cathode follower stages, the output is of low impedance.

The standard models of the **VARI-SWEEP MODEL RADAR** and **MODEL IF** provide for a complement of up to 11 crystal controlled, individually switched markers. The frequencies of the markers may be selected anywhere within the operating range of the sweeping oscillator, and are specified by the purchaser when ordering an instrument. In special models, marker crystals of varied arrangements and switching, can be provided. In the **VARI-SWEEP MODEL RADAR,** *cat. #865AW,* 16 individual crystal markers are switched by a rotary switch which selects the crystal markers in varying groups. Crystal markers in all units are pulse type markers fed directly to the vertical input of the scope. They are completely independent of the circuit under test and neither overload the circuit nor disappear in traps or regions of low amplification. A marker **INCREASE PIP LEVEL** control *(R-140)* assures marks of a convenient height regardless of the amplitude of the sweeping frequency.

The **VARI-SWEEP MODELS RADAR,** *cat. #865 & cat. #865AW,* and **VARI-SWEEP MODEL IF,** *cat. #866* include a variable frequency marker. The variable marker is generated by a separate CW oscillator *(V-6)* which operates at a fundamental frequency and covers the frequency range of the sweeping oscillator. A separate, individually calibrated, direct-reading frequency dial is accurate to ±1%. The variable marker is a "birdie pip" type of marker easily distinguishable from the fixed, pulse-type marks. All coupling is provided within the unit, and the variable marker is completely isolated from the RF circuits under test. A separate **VARiable LEVEL** adjust control *(R-100)* is provided for adjusting the amplitude of the variable marker. In special models, the variable marker can be brought out as a separate CW signal source.

The **VARI-SWEEP MODEL IF** and **MODELS RADAR,** *cat. #866, 865 & 865AW,* are designed for either rack or cabinet mounting. All operating controls and adjustments are located on the front panel.

C. SPECIFICATIONS.

SWEEPING FREQUENCY OUTPUT.

Frequency Range:
Model IF - 4 to 120 MC.
Model Radar (cat. #865) - 10 to 145 MC.
Model Radar (cat. #865AW) - 10 to 130 MC.

Sweep Width:
Model IF - Continuously variable to maximum of at least 30 MC above 50 MC and 60% of center frequency below 50 MC.
Model Radar (cat. #865) - Continuously variable to maximum of at least 30 MC above 50 MC and 60% of center frequency below 50 MC.
Model Radar (cat. #865AW) - 70 MC at 130 MC. Continuously variable to a maximum of 30 MC above 50 MC and 60% of center frequency below 50 MC.

Sweep Output: Synchronized sawtooth. Amplitude approximately 7.0 volts peak.

Repetition Rate: Variable around 60 cps. Locks to line frequency.

Attenuators: Switched 20 db, 10 db, and 3 db plus continuously variable 6 db.

Zero Reference: A zero reference line is produced on the oscilloscope during display retrace time.

MARKERS: Pulse type crystal controlled markers which are accurate to ±0.05%.

Marker Amplitude: Continuously variable from zero to approximately 5.0 volts peak.

Variable Marker: Birdie pip type marker variable from 5 to 170 MC in six switched overlaping bands. Accurate to within ±1%.

TUBE COMPLEMENT:

Model IF and Model Radar (cat. #866 & #865).

5718	2	6V6	1	6BK7A	1
5963	1	OA2	1	12AU7	2
6J6	1	6AU6	2	12AT7	3

Model Radar (cat. #865AW).

5963	1	5718	2	6BK7A	1
6J6	1	6AU6	2	12AU7	2
6V6	1	OA2	1	12AT7	4

POWER SUPPLY: Input approx. 117 volts (±10%), 50-60 cps, 160 watts, AC power, electronically regulated.

POWER SUPPLY TUBE COMPLEMENT:

5U4G	1	6AG5	1	5651	1
6AQ5	3	OB2	1	12AU7	1

DIMENSIONS: 12"d x 19¼"l x 11½"h.

WEIGHT: 46 lbs.

D. EQUIPMENT SUPPLIED.

VARI-SWEEP.

Instruction Book.

One 70 Ω coaxial cable with two IPC connectors.

R.F. Cable not supplied after March 1, 1960

E. ADDITIONAL EQUIPMENT REQUIRED BUT NOT SUPPLIED.

Oscilloscope.

Interconnecting Cables.

Additional crystals if non-standard markers are required.

SECTION II
INSTALLATION

A. GENERAL.

The **VARI-SWEEP MODELS RADAR** and **MODEL IF** are designed for table-top operation and thus present no special installation problems. However, to insure optimum operation, the equipment should not be subjected to excessive moisture, vibration or temperature conditions. The installation should also include provisions for connection to an oscilloscope, to the circuit under test, and to a 160 watt source of 117 volt (±10%), 60 cps, AC power.

B. INTERCONNECTION DATA.

MODELS IF & RADAR

1. **OSCILLOSCOPE CONNECTIONS** *(refer to Fig. 1).*

   a. Connect the **SWEEP OUTPUT** terminals directly to the horizontal axis input terminals of the oscilloscope.

   b. Connect the **PIP OUTPUT** terminals directly to the vertical axis of the oscilloscope. If the addition of the marker signals appears to alter the shape of the response curve, insert a series 47K non-inductive resistor at the oscilloscope end of the cable between the **PIP** terminals and the oscilloscope.

2. **EQUIPMENT UNDER TEST.** The **VARI-SWEEP MODEL IF & MODEL RADAR** are designed to work into a 70-ohm impedance. If the input impedance of the equipment under test matches this value, use the output cable supplied with the **VARI-SWEEP** to make a direct connection from the **SWEEPing OSCillator OUTPUT** jack to the circuit input. If the impedance match is important and the impedance of the circuit under test differs substantially from 70 ohms, an impedance-matching network must be used between the **VARI-SWEEP** output and the circuit input. For optimum operation, the length of all interconnecting cables should be kept to a minimum.

3. **VARIABLE FREQUENCY MARKER.** A variable frequency marker is incorporated in the design of the unit and is available at the same panel terminals as the fixed markers.

MODEL RADAR *(cat. #365AW only)*

If the addition of the marker pips appears to alter the shape of the response curve or load the output, the standard connecting procedure should be changed to that of *Fig. 2.*

1. **OSCILLOSCOPE CONNECTIONS.**

   a. Connect the **SWEEP OUTPUT** terminals directly to the horizontal axis input terminals of the oscilloscope.

   b. Connect the **SCOPE** output jack *(J-4)* to the vertical input of the oscilloscope.

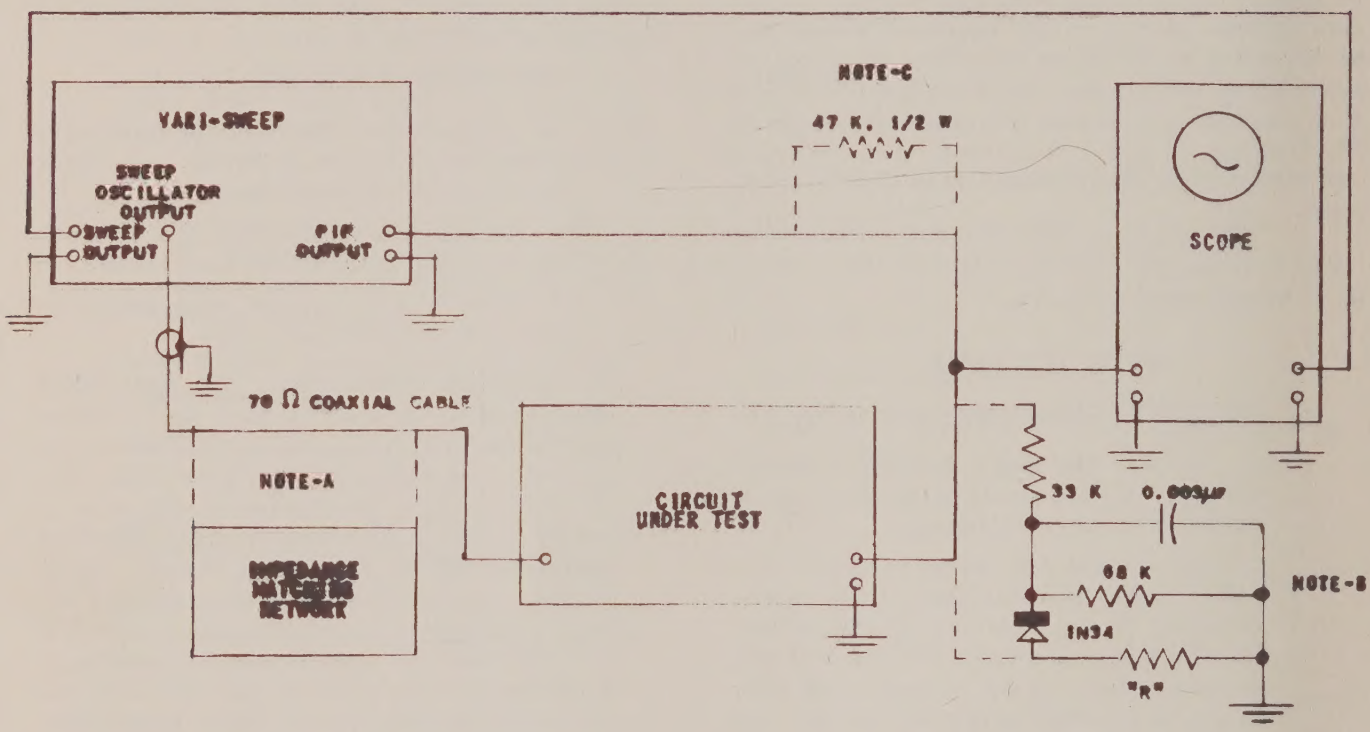
   c. Connect the detected sweep output to the **DETected INPUT** jack *(J-5).*

2. **EQUIPMENT UNDER TEST.** The **VARI-SWEEP MODEL RADAR** is designed to work into a 70-ohm impedance. If the input impedance of the equipment under test matches this value, use the output cable supplied with the unit to make a direct connection from the **SWEEPing OSCillator OUTPUT** jack to the circuit input. If the impedance match is important and the input impedance of the circuit under test differs substantially from 70 ohms, an impedance-matching network must be used between the **VARI-SWEEP** output and the input of the circuit under test. For optimum operation, the length of all interconnecting cables should be kept to a minimum.

3. **VARIABLE FREQUENCY MARKER.** A variable frequency marker is incorporated in the design of the unit and is available at the same panel terminals as the fixed markers.

C. CRYSTAL FREQUENCIES.

The **VARI-SWEEP** does not have standard crystal markers. There are, however, provisions for a maximum of sixteen crystal controlled markers. The frequency of these crystals are stated when the unit is ordered and will vary according to the particular needs of the purchaser.



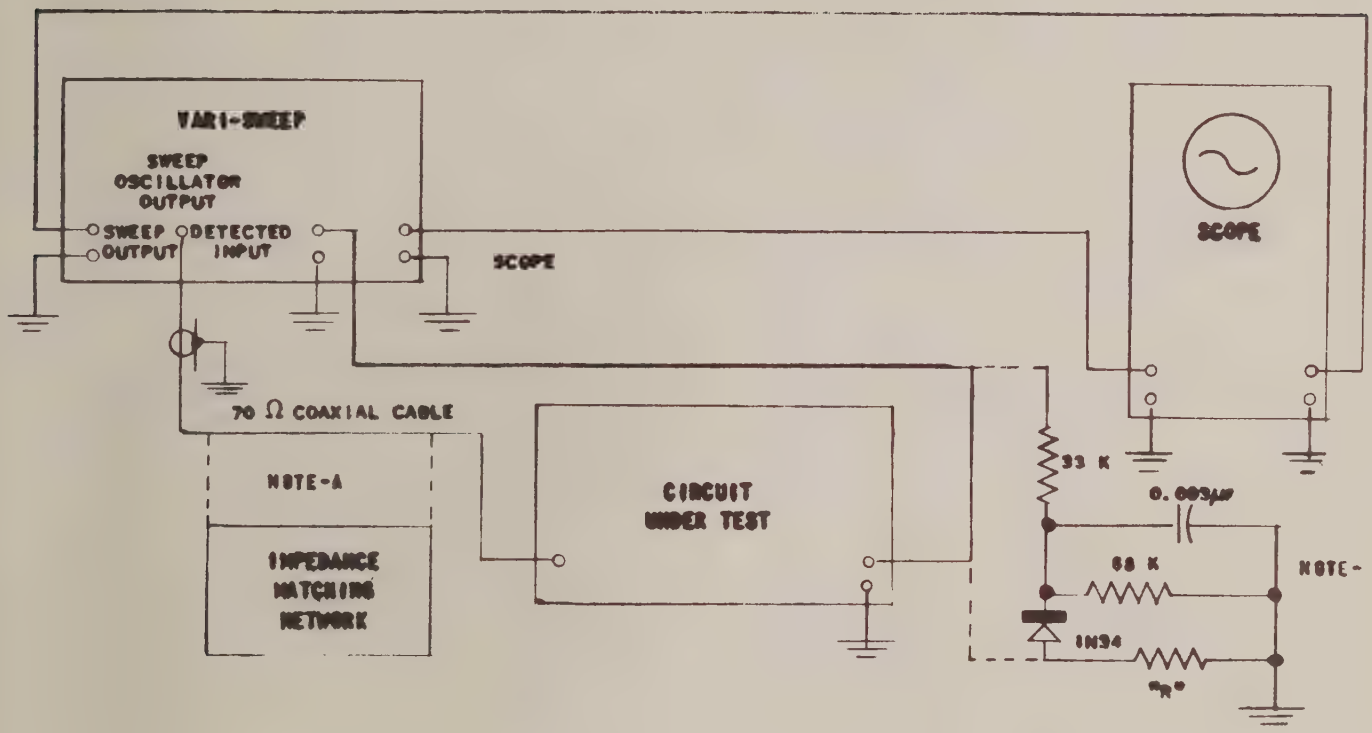
Notes:

A. If input impedance of circuit under test is not 70 ohms, use impedance-matching network in input.

B. If bandpass of oscilloscope is less than that of circuit being tested, insert illustrated detector circuit in output circuit under test. Value of "R" determined by lead requirements of tested circuit.

C. If addition of pip marker signals affects shape of sweeping oscillator signal, insert 47K, ½W, noninductive resistor at the oscilloscope end of the lead between the pip terminal and the oscilloscope.

Figure 1, Vari-Sweep Model Radar #865 & IF #866 Interconnection Block Diagram.



Notes:

A. If input impedance of circuit under test is not 70 ohms, use impedance-matching network in input.

B. If bandpass of oscilloscope is less than that of circuit under test, insert illustrated detector circuit in output circuit under test. Value of "R" determined be lead requirements of tested circuit.

Figure 2, Vari-Sweep Model Radar #865AW, Interconnection Block Diagram

SECTION III
OPERATION

A. IDENTIFICATION OF CONTROLS.

1. **SWEEP OUTPUT Jack.** These GRC terminals bring out the 60 cps linear sawtooth sweep voltage which is used as a horizontal deflection signal. They are normally connected directly to the horizontal (X-axis) input of the oscilloscope.

2. **Sweep REPetition RATE Control.** This potentiometer provides a means of varying the repetition rate of the sawtooth voltage appearing at the **SWEEP OUTPUT** terminals. For normal operation, the sawtooth sweep rate is "locked in" at the nominal 60 cps line frequency. However, for special tests such as hum measurement, the repetition rate may be varied over a 30–70 cps range.

3. **PIP ADJust Control.** The proper setting for this front panel potentiometer is a point midway between the setting at which one or more of the crystal controlled markers disappears and the setting at which multiple or distorted pips appear. In addition, this control acts as a vernier for the internal pip multivibrator adjustment.

4. **PIP LEVEL Control.** This front panel potentiometer, located next to the **PIP OUTPUT** terminals, is used to adjust the amplitude of the variable and crystal controlled markers over a range of zero to 5 volts peak.

5. **PIP OUTPUT Terminals.**

   a. **MODEL RADAR** *(cat. #865)* **& MODEL IF** *(cat. #866).* When one or more of the marker switches is in the upper position, the respective crystal controlled pulse type markers appear at these GRC terminals *(J-3).*

   b. The **MODEL RADAR** *(cat. #865AW)* deviates from this procedure somewhat in that the crystal markers are selected in varying groups. They are normally connected directly to the vertical input of the scope. This provides markers whose amplitude is independent of the characteristics of the circuit under test.

6. **VARiable LEVEL Marker Control.** This potentiometer, which is located to the right of the **SWEEP WIDTH** control, is used to vary the amplitude of the variable marker.

7. **SWEEP WIDTH Control.** This front panel potentiometer may be used to adjust the width of the sweeping signal. Sweep width is continuously variable to a maximum of at least 30 MC above 50 MC or, at lower frequencies, 60% of the center frequency. It is at its maximum when the control is set completely clockwise.

8. **CRYSTAL MARKER Switches (MODEL RADAR** *cat. #865* **& MODEL IF** *cat. #866).*

   a. Each of these toggle switches controls one of the eleven crystal controlled markers provided as frequency indicators. These pulse type markers, which may be used either individually or collectively, are fed directly from the **PIP OUTPUT** terminals to the vertical (Y-axis) input of the oscilloscope and are thus independent of the circuits under test.

   b. **MODEL RADAR** *cat. #865AW.* The individual crystal marker switches are replaced by a rotary switch which selects the crystal markers in varying groups.

9. **SWEEPING OSCILLATOR Band Selector Switch.** A six position, rotary, drum switch is used to select the proper range for the desired operating frequency. Tuning for the three lower bands is shown on the dial immediately above this control. Tuning for the three upper bands is shown on the dial below this control.

10. **VARIABLE MARKER Band Selector Switch.** A six position, rotary, drum switch used to to select the proper CW range for the desired marker frequency.

11. **SWEEPING OSCILLATOR Frequency Control.** This variable capacitor is used to set the center frequency of the sweeping output to any desired point within each band.

12. **VARIABLE MARKER Frequency Control.** This variable capacitor is used to set the variable marker at any desired point on the sweep.

13. **Sweeping Output Amplitude Controls.** These four controls, a variable attenuator (marked **INCREASE**) and three switched attenuators (**20 DB, 10 DB & 3 DB**) are used to control the amplitude of the signal appearing at the adjacent **SWEEPing OSCillator OUTPUT** jack. These three precise switchable attenuators are

additive and may be used either individually or collectively. The variable attenuator provides an additional 6 db range of amplitude control.

14. **SWEEPing OSCillator OUTPUT Jack.** This coaxial connector delivers the final output of the sweeping oscillator circuits. The maximum output level is 1.0 volts into 70 ohms, nominal. This output is normally fed directly to the circuit under test.

15. **ON-OFF Power Switch.** This toggle switch, which is located in the center of the front panel, controls the AC power to the **VARI-SWEEP.** When this switch is in the **ON** position, the dial lights come on, indicating that all filament circuits are energized and B+ has been applied to the 6J6 sweep generator tube *(V-2)* and the AGC amplifiers *(V-8 & V-9)*.

16. **STANDBY Switch.** This toggle switch, located to the right of the **ON-OFF** power switch, controls the B+ supply to all stages of the **VARI-SWEEP** except the (6J6, *V-2*) sweep generator circuit and AGC amplifiers (6AU6, *V-8 & V-9*).

NOTE: The following two connectors apply to the **VARI-SWEEP RADAR** *cat. #865AW only.*

17. **DETected INput** *(J-5)*. This IPC connector, located in the center of the front panel below the **VARiable LEVEL** marker control, is used to feed the detected output of the circuit under test to the cathode follower stage *(V-15)*.

18. **SCOPE Output** *(J-4)*. After the internal mixing of the pips with the detected input, the signal is brought out to this GRC connector.

NOTE: The following internal potentiometers and capacitors are factory-adjusted and normally should not be changed unless necessitated by component replacement or serious misalignment of the equipment.

19. **Linearity Adjust Control** *(R-29)*. This internal potentiometer, located on the left side of the chassis, is adjusted until the rate of frequency change is linear across the entire sweep width.

20. **Pip Adjust Control** *(R-137)*. This internal potentiometer, located on the right side of the chassis immediately behind the front panel, is used in conjunction with the front panel **PIP ADJust** control to regulate the sensitivity of the pip generator tube. It is properly adjusted when the range of the front panel control is maximized.

21. **Sync Lock Control** *(R-9)*. This internal potentiometer, located on the rear center of the chassis deck, is used in conjunction with the **REP RATE** control to determine repetition rate of the sawtooth voltage. It is normally set to lock the repetition rate at 60 cps.

B. OPERATING PROCEDURE.

1. Set up equipment as described in Section II, Installation, and *Figures 1* or *2*.

2. Throw **ON-OFF** power switch to **ON** position. Wait several minutes to allow tubes to warm up.

3. Throw **STANDBY** switch to **ON** position. *Wait another few minutes to allow the equipment to stabilize itself.*

4. Adjust scope controls until usable response curve is obtained on oscilloscope.

5. Adjust **REP RATE** control until stationary pattern is obtained on oscilloscope.

6. Set **SWEEPING OSCILLATOR** and frequency control to desired center frequency.

7. Adjust **SWEEP WIDTH** control to obtain desired sweep width about center frequency.

8. Set **INCREASE** control of sweep oscillator output and switchable attenuators to obtain desired amplitude on sweeping signal.

9. If crystal controlled markers are required, throw appropriate **CRYSTAL MARKERS** switches to **ON** position.

10. If a variable marker is required, it is obtainable at the **PIP OUTPUT** connector *(J-3)*, and its amplitude is increased or decreased by ahe **VARiable LEVEL** marker control.

11. Rotate **PIP ADJust** control until full complement of stable markers appear on the oscilloscope.

12. Adjust **INCREASE PIP LEVEL** control until markers are of desired height.

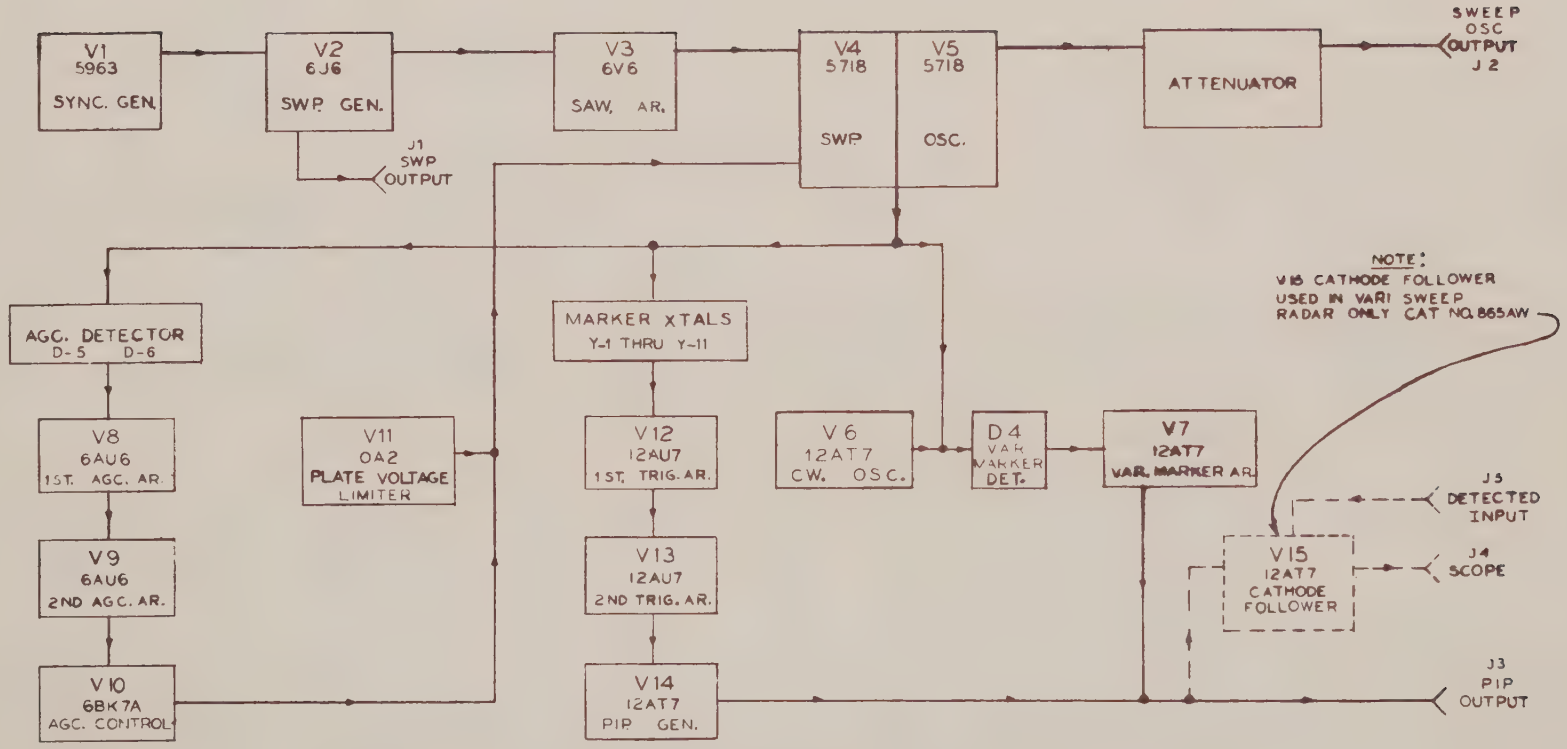


Figure 3, Vari-Sweep Model IF & Models Radar Functional Block Diagram

SECTION IV
THEORY OF OPERATION

A. GENERAL.

The operation of the **VARI-SWEEP** can be more readily comprehended by referring to *Figure 3*, the functional block diagram, and *Figures 7 & 8*, the complete schematics of the frequency generating circuits. In addition to a regulated power supply, the basic circuits of the **VARI-SWEEP** include:

1. Sawtooth Sweep Circuits.
2. Sweeping Oscillator Circuits.
3. AGC Circuits.
4. CW Oscillator Circuits.
5. Marker Circuits.

B. SAWTOOTH SWEEP CIRCUITS.

These circuits generate a regular sawtooth voltage which is normally locked to the 60 cps power line frequency. For hum measurements and other special tests, this rate may be varied over a range of 30-70 cps by adjusting one internal and one front panel potentiometer. The sawtooth signal is used both as a horizontal deflection signal for the auxiliary oscilloscope and to drive the sweeping oscillators through their respective ranges.

1. **SYNC GENERATOR** *(V-1)*. This stage uses a 5963 dual-triode in a Schmitt trigger circuit to generate a negative synchronizing pulse for the succeeding sweep generator. A small portion of the 60 cps filament voltage is fed directly to the grid (pin 2) of the tube. The repetition rate of the sync generator is controlled by this signal and the setting of the internal sync lock control.

2. **SWEEP GENERATOR** *(V-2)*. This 6J6 square wave generator is essentially a free-running multivibrator whose repetition rate is determined both by the setting of the **REP RATE** control *(R-11)* and the operation of the preceding sync generator. To provide a clear, zero-voltage reference line, the square wave output is fed to the grid of the sweeping oscillators *(V-4 & V-5)* thereby disabling it during the negative portion of the square wave generator's output. The square wave is also fed to an integrating network which shapes it to a regular sawtooth. This voltage is then fed to the **SWEEP OUTPUT** terminals, where it is used as a horizontal deflection signal for the oscilloscope, also to the sawtooth amplifier *(V-3)*.

C. SWEEPING OSCILLATOR CIRCUIT.

This circuit uses a saturable reactor technique to generate a linear sweeping voltage synchronized to the sawtooth **SWEEP OUTPUT** voltage. The circuitry includes a sawtooth amplifier *(V-3)* and a sweeping oscillator whose output is used as a sweeping frequency for the circuits under test.

1. **SAWTOOTH AMPLIFIER** *(V-3)*. This stage employs a 6V6 pentode to provide linear amplification of the nominal 60 cps sawtooth signal from the shaping network. The B+ supply for this tube is fed to its plate circuit through the control winding of a saturable reactor. As the plate current of *V-3* varies with the sawtooth voltage on its grid, it causes a corresponding variation in the inductance of the saturable reactor secondary and thus in the output frequency of the sweeping oscillator. The setting of the **SWEEP WIDTH** potentiometer controls the amplitude of the sawtooth voltage applied to the grid of *V-3* and thus the duration (width) of sweeping output of *V-4 & V-5*.

2. **SWEEPING OSCILLATOR** *(V-4 & V-5)*. These tubes, 5718 triodes, are used to generate a sweeping output whose center frequency is determined by the setting of the band selector and the frequency control. The width of the sweeping output is controlled by the **SWEEP WIDTH** potentiometer.

The frequency at any given time is determined by the permeability of the saturable reactor secondary and thus by the magnitude of sawtooth amplifier plate current flowing through the primary winding. The sweeping output is coupled from the plate circuit through a pick-off coil. The output is then fed to the AGC detector diodes, the attenuator, the marker circuit, and the CW diode mixer.

D. AGC CONTROL CIRCUITS.

These circuits sample the output voltage and apply a varying plate voltage to the sweep oscillators to correct any variations in amplitude with frequency or band position, as well as increase overall stability.

1. **AGC DETECTOR.** These are two high frequency diodes used in a conventional voltage doubler arrangement, whose output is fed to the first AGC amplifier, *V-8*.

2. **FIRST AGC AMPLIFIER** *(V-8)*. The rectified voltage from the AGC diodes is applied to the control grid of the first AGC amplifier. The 105 volt DC supply obtained from the OB2 gas regulator tube in the power supply is applied to the screen grid. Any change in either the **INCREASE** setting or the output of the unit will cause this stage to draw more or less current and therefore will change its plate voltage, which is directly coupled to the grid of the second AGC amplifier *(V-9)*. This stage is blanked during the retrace portion of the sweep. This procedure is used so that when the oscillator voltage drops to zero, the lack of signal at the grid will not cause a large increase in oscillator plate voltage.

3. **SECOND AGC AMPLIFIER** *(V-9)*. A 6AU6, the second AGC amplifier, further amplifies the control voltage from the preceeding stage and in the same fashion directly biases the grid of the next stage.

4. **AGC CONTROL STAGE** *(V-10)*. A 6BK7A, AGC control tube, is used as a series regulator stage. The current flow through this tube is controlled by the bias placed on its grids by direct coupling from the preceeding stage. The 430 volt potential on its plates is dropped to 150V at its cathode, which becomes the sweep oscillator *(V-4 & V-5)* plate supply.

5. **PLATE VOLTAGE LIMITER** *(V-11)*. An OA2, 150V gas regulator tube, is placed at the cathode output of the 6BK7A, the AGC control stage. A small dropping resistor is used to bleed off sufficient current from this stage to keep the voltage on the plates of oscillator tubes from exceeding their maximum rating.

E. CW OSCILLATOR CIRCUITS.

The variable marker is generated by a separate CW oscillator. The output is mixed with the sweep oscillator signal, detected, shaped, and then fed to an audio amplifier (the variable marker amplifier, *V-7*) and subsequently to the **PIP OUTPUT** terminals *(J-3)*.

1. **CW OSCILLATOR** *(V-6)*. A 12AT7 is used in a conventional tuned plate, push-pull CW oscillator, whose frequency of oscillation is determined by the setting of the band selector and the frequency control. The output of this stage is fed to the variable marker detector *(D-4)*.

2. **VARIABLE MARKER DETECTOR**. A high frequency diode is used in a simple detector arrangement. This circuit detects the beat frequency which is the result of mixing the CW and the sweep. Its output is fed to a shaping network and then to the grid of the variable marker amplifier *(V-7)*.

3. **VARIABLE MARKER AMPLIFIER** *(V-7)*. This circuit uses a 12AT7 as an audio amplifier whose function is to amplify the shaped detected resultant of the sweep and the CW outputs. The output of the amplifier is then fed to the **PIP OUTPUT** connectors *(J-3)*.

F. MARKER CIRCUITS.

These circuits are used to generate pulse-type crystal controlled markers which are accurate to ±0.05%. They include a series of tuned absorption type crystal filter circuits (which form the fixed markers), two pulse amplifiers, and a pip generator.

1. **CRYSTAL MARKER CIRCUITS** *((Y-1 thru Y-11) (Y-16))*. These crystals are used in absorption type marker circuits to produce the crystal controlled markers. As the frequency of the sweeping oscillator passes through a given crystal frequency, that crystal generates a train of oscillations which are rectified and applied to the control grid of the first trigger amplifier *(V-12)*.

2. **FIRST TRIGGER AMPLIFIER** *(V-12)*. This stage employs a 12AU7 dual triode to provide two stages of amplification for the trigger voltage generated by the crystal marker. A 50K potentiometer ganged with the **INCREASE** control has been added to the plate circuit to keep the marker output constant as the **INCREASE** control is varied. A **PIP ADJust** control has also been added to the plate circuit to control the level of the triggering pips. This control is adjusted to supply pips of sufficient amplitude without causing spurious pulses. The amplified output is fed to the second trigger amplifier *(V-13)*.

3. **SECOND TRIGGER AMPLIFIER** *(V-13)*. This stage employs a 12AU7 which provides an additional two stages of amplification for the marker trigger pulses before feeding them to the pip generator multivibrator *(V-14)*.

4. **PIP GENERATOR** *(V-14)*. This stage is a one shot multivibrator employing a 12AT7 dual triode. Positive trigger pulses from the

second trigger amplifier are supplied to the grid of *V-14*. Each trigger pulse causes the multivibrator to produce one positive marker pulse. This pulse is fed to the **INCREASE PIP LEVEL** control, then to the **PIP OUTPUT** terminal *(J-3)*.

SECTION V
MAINTENANCE

A. TROUBLE LOCATION.

CAUTION: This equipment contains voltages in excess of 500 volts. Use extreme care in performing maintenance on this equipment.

If the operation of the **VARI-SWEEP** appears to be defective in any respect, first ascertain that the cause of improper operation is not in the oscilloscope, the circuit under test, or the interconnecting cables. If a process of elimination indicates that the trouble originates in the **VARI-SWEEP**, make the following preliminary checks:

1. Check the operation of all **VARI-SWEEP** circuits to determine the exact nature and extent of the defect.

2. Make a visual check to determine that all filaments are lit and that there are no loose connections or obviously damaged components.

3. Check the voltage level at the AC line and the B+ output.

The most common troubles encountered with the **VARI-SWEEP** are weak or defective tubes, crystal diode failures, and occasional misalignments. The trouble location chart below may be used as a guide to isolate the trouble in a particular circuit or stage. *Figure 7* or *8*, complete schematic of the **VARI-SWEEP** frequency generating circuits, indicates the normal voltage measurements at significant points in the circuitry. A complete schematic of the regulated power supply used with the **VARI-SWEEP** is shown in *Figure 5*.

Table I, Trouble Location Chart

SYMPTOM	PROBABLE CAUSE AND CORRECTION
No horizontal deflection.	Check sawtooth generating circuits *(V-1 & V-2)*; check power supply.
Pattern unstable; will not lock in.	Check sync generator *(V-1)*; internal sync lock pot *(R-9)* and **REP RATE** potentiometer *(R-11)* settings.
No vertical deflection.	Check sweeping oscillators *(V-4 & V-5)*, AGC control *(V-10)*.
Frequency deviation not linear.	Check sawtooth amplifier *(V-3)*; check setting of linearity potentiometer *(R-29)*.
Amplitude sweeping output not constant.	Check AGC amplifiers *(V-8 & V-9)*, and AGC control *(V-10)*.
No marker output.	Check first trigger amplifier *(V-12)*, second trigger amplifier *(V-13)*, pip generator *(V-14)* and internal pip adjust *(R-137)*.
Loss of variable marker; fixed markers normal.	Check CW oscillator *(V-6)*, variable marker amplifier *(V-7)*.

B. ALIGNMENT AND ADJUSTMENT.

1. PLATE VOLTAGE ADJUSTMENT. The B+ potentiometer *(R-15)* located on the power supply chassis, should be adjusted to set the B+ to 250 volts DC.

2. ALIGNMENT OF SAWTOOTH SWEEP CIRCUITS.

a. Connect SWEEP OUTPUT terminals to vertical (Y) axis of scope with calibrated face.

b. Adjust REP RATE control to set sweep rate to general range of 60 cps line frequency.

c. Adjust internal sync lock control, mounted on the rear of the chassis deck, to lock in sweep output to 60 cps line frequency.

d. Signal should have triangular waveshape and at least 7.0 volt peak-to-peak amplitude. Sync should hold over at least 30 degree rotation.

3. SWEEPING OSCILLATOR & CW OSCILLATOR ALIGNMENT. The user should not attempt to adjust either the sweeping oscillator or the CW oscillator as the dials are individually calibrated for each instrument and any adjustment would cause these dials to read incorrectly.

4. MARKER ADJUSTMENT.

a. Connect SWEEP OUTPUT terminals to horizontal input (X-axis) of oscilloscope.

b. Connect both sweeping oscillator output and pip output to vertical (Y-axis) input of oscilloscope through a suitable detector.

c. Energize all crystal markers. Make certain one spike appears for each energized marker.

d. Set front panel PIP ADJust to mid-position.

e. Adjust pip generator potentiometer (int.), *R-137*, until oscillator is free-running (multiple uncontrolled pips appear). Back off this adjustment to a point just below the free-running condition where a full complement of pips appear. Make a slight readjustment of this control to reach a point which affords the greatest amount of variation of the front panel PIP ADJust control between the limits of disappearing pips and multiple pips.

SECTION VI
200A POWER SUPPLY INSTRUCTIONS

A. DESCRIPTION.

Power Supply No. 200A is a regulated DC voltage supply with output voltage adjustable between 225 and 275 volts. The unit operates from a 117V, 60 cps power source. Constructed on an individual chassis, the supply is a completely self-contained unit designed for operation in conjunction with a test instrument requiring a highly stable DC voltage source. The supply is normally enclosed in the same cabinet as the associated RF circuitry.

B. POWER SUPPLY CIRCUIT DETAILS.

This regulated power supply furnishes all filament and DC power required by the RF circuits of the test equipment.

1. RECTIFIER CIRCUIT. High voltage is supplied from the secondary of *T-1* to the conventional full wave rectifier *(V-1)*, a 5U4GB dual diode. The rectified output voltage is filtered by *C-1*, *L-1* and *C-2*, and fed to the voltage regulator circuits.

2. VOLTAGE REGULATOR CIRCUIT. The filtered DC voltage from *V-1* is fed through a regulating circuit comprising *V-2*, *V-3* and *V-4* to the output terminal. *V-2*, *V-3* and *V-4* are effectively connected in parallel and function as a variable series resistance to control the output voltage. The remaining stages in the power supply *(V-5, V-6, V-7 & V-8)* detect and amplify any significant output voltage changes and feed them to the control stage. They function in the following manner:

The 5651 regulator tube *(V-8)* in the *V-6* circuit has a non-linear effect which causes a small increase at the power supply output to produce a relatively large change at the grid of *V-6*. This tube, its cathode potential regulated by *V-7*, then draws a higher plate current, causing a dip in voltage at the plate of *V-6* and grids of *V-5*. This decrease in *V-5* grid voltage lowers its plate current, reducing the voltage developed across *R-11*.

Since *R-11* is also the bias resistor for the control tubes *(V-2, V-3 & V-4)*, their plate to cathode resistance increases, thereby lowering the power supply's output voltage.

For a decrease in output voltage, the controlling action described above is reversed. *R-15* provides an output voltage adjustment for initially setting the DC output voltage to the required value.

C. MAINTENANCE.

1. **VOLTAGE ADJUSTMENT.** The setting of *R-15* determines the DC voltage output of the power supply. To adjust *R-15*, connect a DC voltmeter at the B+ terminals on the associated equipment; with all power on and power supply under full load, set *R-15* to the required voltage input for the associated equipment.

2. **TROUBLE LOCATION.** The following chart should aid in locating troubles in the power supply:

Table II, Trouble Location Chart

SYMPTOM	PROBABLE CAUSE AND CORRECTION
Zero output voltage from power supply; no heaters light.	Check fuse; if blown, check *C-1* and *C-2* for short before replacing. Also check *V-1* for short. Check AC wiring; check *T-1* and *T-2*.
Zero output voltage, all tubes light.	Check *V-1*. Check *C-2*, *C-3*, *C-5a* and *C-5b* for shorts. Check for open HV winding on *T-1*; check associated equipment for B+ short.
Low output voltage; poorly regulated.	Check tubes *V-1*, *V-2*, *V-3*, *V-4*, *V-5*, *V-6*, *V-7* and *V-8*. Check *C-4* and *C-6* for shorts. Check *R-15*, *R-17*.
Voltage output higher than normal. Poor regulation.	Check *V-8*. Open *R-15*. Check tubes *V-5*, *V-6* and *V-7*.
Excessive ripple in DC output.	Check *C-1* and *C-2*. Check for excessive load on supply.

SECTION VII
PARTS LIST

A. 200A POWER SUPPLY. *(KB-2548-N)*

Resistors: (UNLESS OTHERWISE SPECIFIED, ALL COMPONENTS ARE FIXED COMPOSITION, 1 WATT, 10% TOLERANCE RESISTORS.)

R-1 330K
R-2 100 OHMS
R-3 33 OHMS
R-4 100 OHMS
R-5 100 OHMS
R-6 33 OHMS
R-7 100 OHMS
R-8 100 OHMS
R-9 33 OHMS
R-10 100 OHMS
R-11 150K
R-12 270K; ½ WATT
R-13 3.3K
R-14 5.6K; 2 WATT
R-15 50K; POT; B+ ADJ.
R-16 330K
R-17 47K

Capacitors:

C-1 6μF; PAPER; OIL FILLED; 600V
C-2 2μF; PAPER; OIL FILLED; 600V
C-3 0.01μF; DISC CERAMIC; 500V
C-4 0.1μF; PAPER; 400V
C-5 *a & b*; 20μF; ELECTROLYTIC; 450V
C-6 1000μμF; GP CERAMIC

Tubes:

V-1 5U4GB
V-2 6AQ5
V-3 6AQ5
V-4 6AQ5
V-5 12AU7
V-6 6AG5
V-7 0B2
V-8 5651

Miscellaneous:

F-1 FUSE; 3 AMP; 250V
J-1 SOCKET; JONES S-308-AB; 8 PRONG
L-1 CHOKE COIL; KAY #5501; 200 MA; 8.5 HENRY; 125 OHMS
P-1 AC LINE PLUG
P-2 SOCKET; JONES S-302-AB; 2 PRONG
T-1 POWER TRANSFORMER; KAY #2520
T-2 FILAMENT TRANSFORMER; 117V PRIMARY; 6.3V SECONDARY; 2.0 AMP.

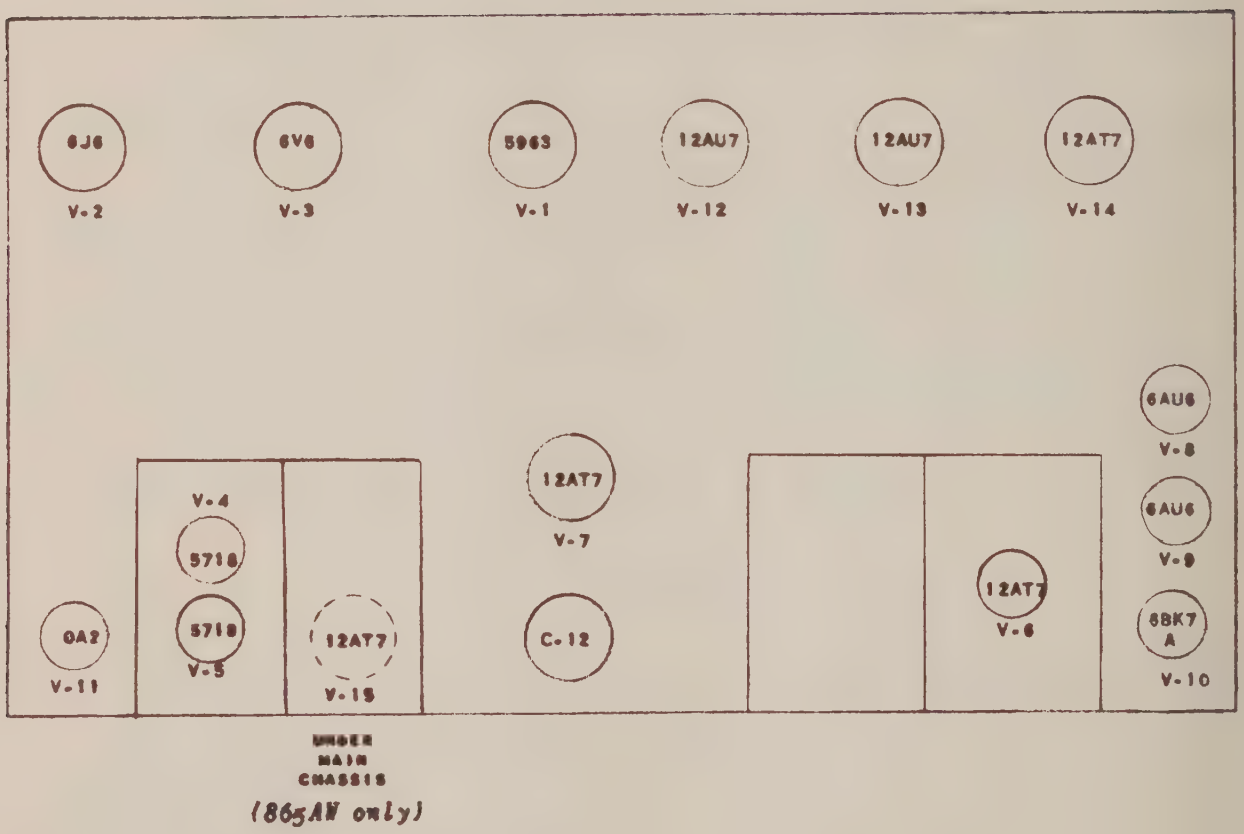


Figure 4, Tube Location Chart, Vari-Sweep Models Radar & IF

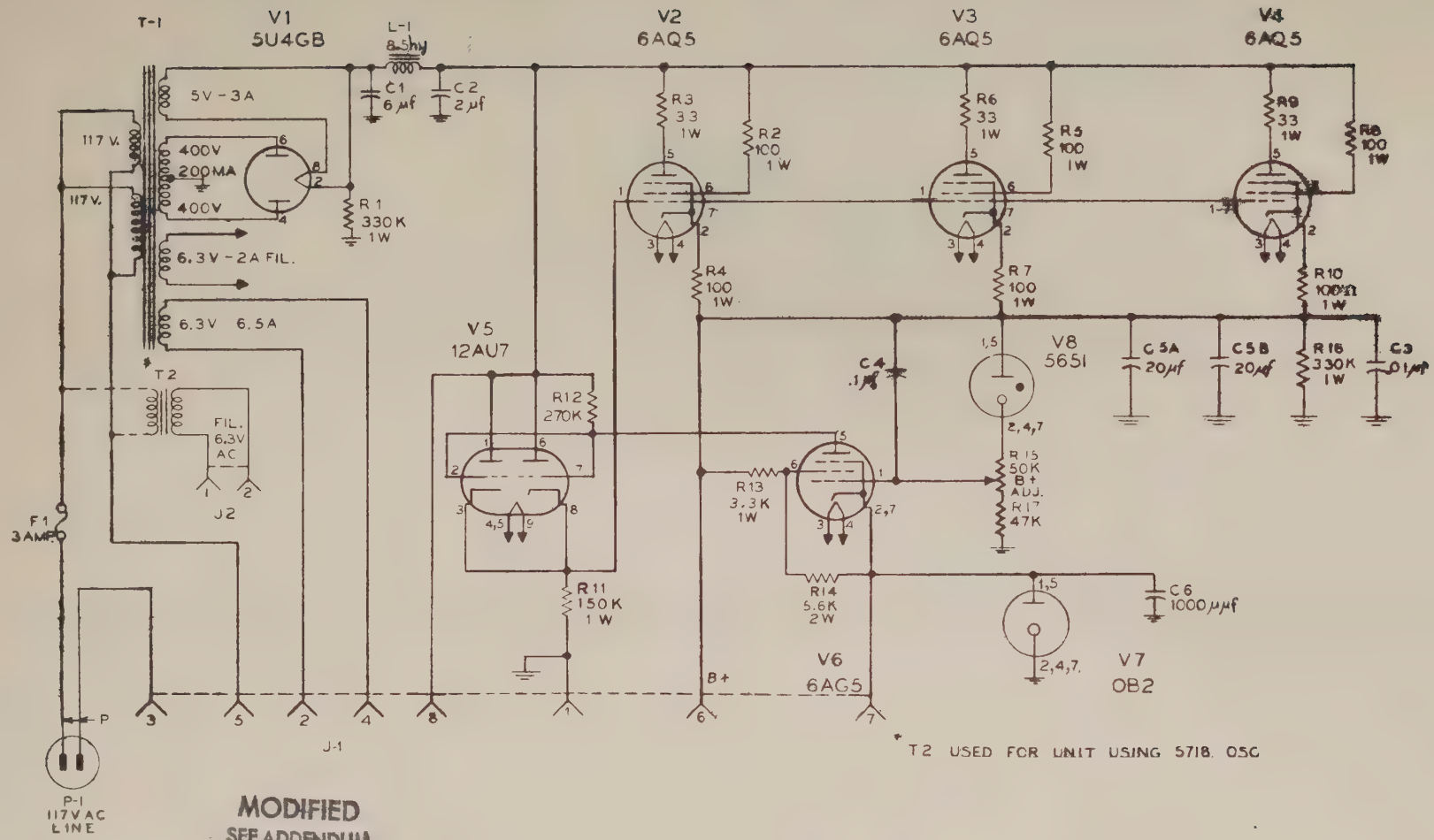


Figure 5, Model 200A Power Supply Schematic, KB-2548-N

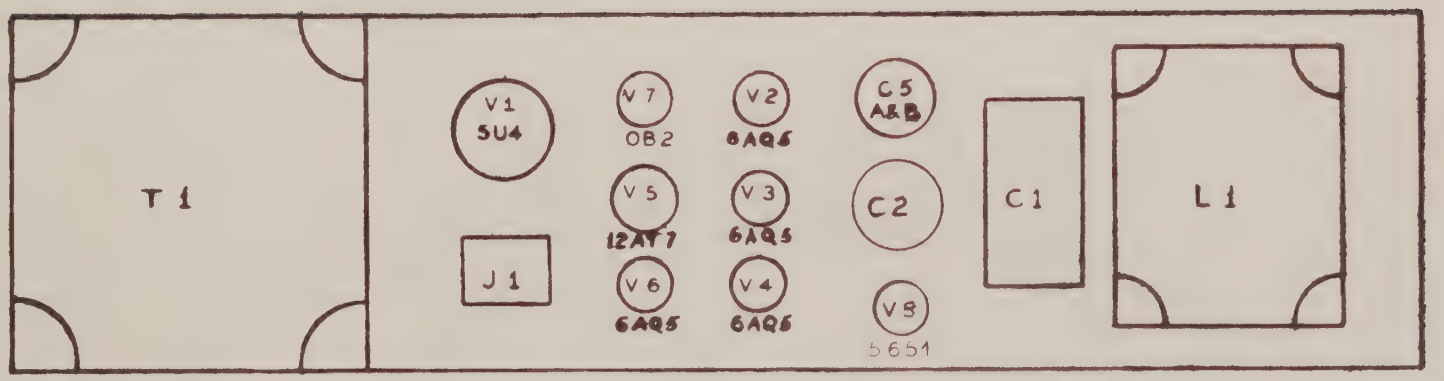
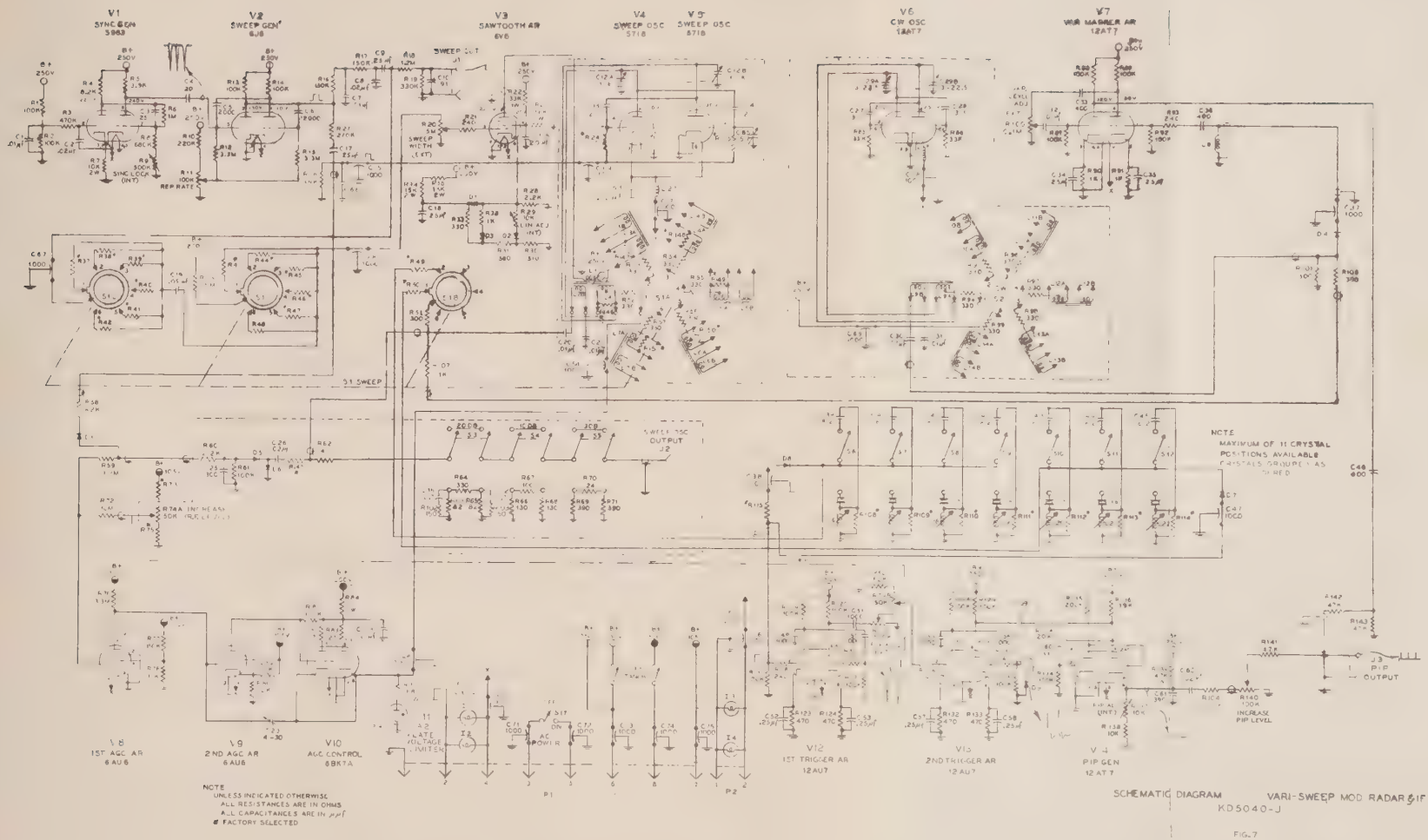


Figure 6, 200A Power Supply Tube Location Chart

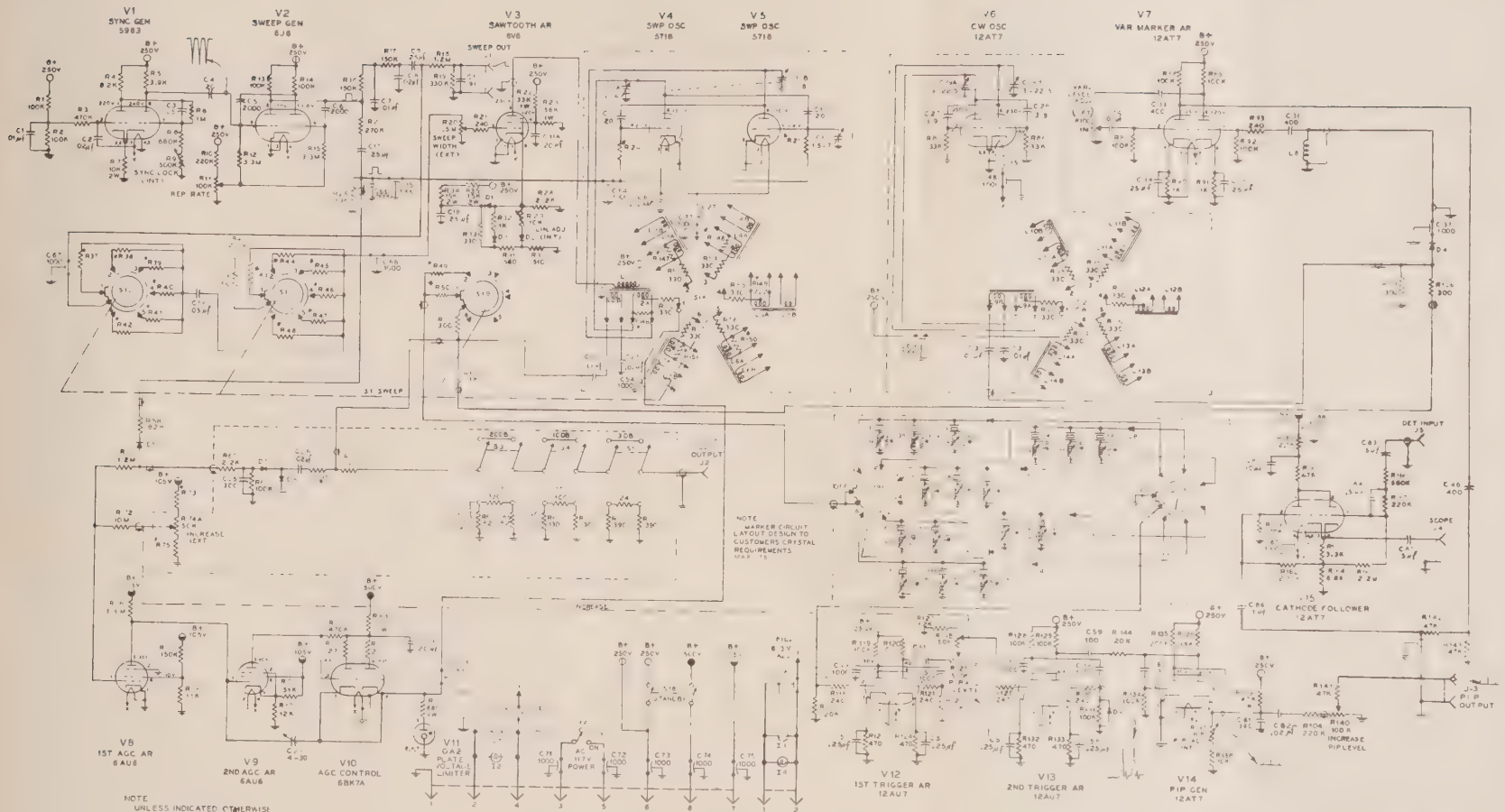
MODIFIED
SEE ADDENDUM
AT REAR OF BOOK



SCHEMATIC DIAGRAM VARI-SWEEP MOD RADAR I/F
KD5040-J

FIG. 7

MODIFIED
SEE ADDENDUM
AT REAR OF BOOK



SCHEMATIC DIAGRAM VARI-SWEEP MODEL RADAR

MODEL 865-AW
KD 5427 E
FIG. 8

MODIFIED
SEE ADDENDUM
AT REAR OF BOOK

B. FREQUENCY GENERATING CIRCUITS. *(KD-5040-J & KD-5427-E)*

Resistors: (UNLESS OTHERWISE SPECIFIED, ALL COMPONENTS ARE FIXED COMPOSITION, ½ WATT, 10% TOLERANCE RESISTORS.)

R-1	100K	R-56	330	R-97	330
R-2	100K	R-57	330	R-98	330
R-3	470K	R-58	82K	R-99	330
R-4	8.2K	R-59	1.2 MEG	R-100	100K; POT; VAR LEVEL ADJ.
R-5	3.9K	R-60	2.2K	R-101	300
R-6	1 MEG	R-61	100K	R-102	150; ¼ WATT
R-7	10K; 2 WATT	R-62	47	R-103	150; ¼ WATT
R-8	680K	R-63	82	R-104	220K
R-9	500K; POT; SYNC LOCK; (INT.)	R-64	330	R-105	680; 1 WATT
R-10	220K	R-65	82	R-106	300
R-11	100K; POT; REP RATE	R-66	130	R-107	1K
R-12	3.3 MEG	R-67	100	R-108	THRU R-116 *
R-13	100K	R-68	130	R-117	120K
R-14	100K	R-69	390	R-118	240
R-15	3.3 MEG	R-70	24	R-119	100K
R-16	150K	R-71	390	R-120	100K
R-17	150K	R-72	10 MEG	R-121	240
R-18	1.2 MEG	R-73	*	R-122	100K
R-19	330K	R-74	A&B 50K DUAL POT INCREASE RF LEVEL	R-123	470
R-20	500K; POT; SWEEP WIDTH	R-75	*	R-124	470
R-21	240	R-76	3.3 MEG	R-125	500K; POT; PIP ADJ.
R-22	33K; 1 WATT	R-77	150K	R-126	240
R-23	56K; 1 WATT	R-78	15K	R-127	62K
R-24	& R-25 *	R-79	51K	R-128	100K
R-26	39K	R-80	12K	R-129	100K
R-27	270K	R-81	470K	R-130	240
R-28	2.2K	R-82	27	R-131	100K
R-29	10K; POT; LIN ADJ. (INT.)	R-83	27	R-132	470
R-30	510	R-84	1K; 5W; WIRE WOUND 10%	R-133	470
R-31	560	R-85	33K	R-134	100K
R-32	1K	R-86	33K	R-135	200K
R-33	330	R-87	100K	R-136	39K
R-34	15K; 2 WATT	R-88	100K	R-137	10K; POT; PIP ADJ. (INT.)
R-35	15K; 2 WATT	R-89	100K	R-138	10K
R-36	15 MEG	R-90	1K	R-139	47K; 1 WATT
R-37	THRU R-50 *	R-91	1K	R-140	100K; POT; INCREASE PIP LEVEL
R-51	300	R-92	100K	R-141	47K
R-52	330	R-93	240	R-142	47K
R-53	330	R-94	330	R-143	47K
R-54	330	R-95	330	R-144	20K
R-55	330	R-96	330	R-145	THRU R-155 *

Capacitors: (ALL CAPACITANCES IN μμF, 500 VOLT DC WORKING, UNLESS OTHERWISE SPECIFIED.)

C-1	0.01μF; DISC, CERAMIC	C-19	0.05μF; PAPER, 400V	C-47	& C-48 1000; FEED THRU
C-2	0.02μF; DISC, CERAMIC	C-20	& C-21 0.01μF; DISC, CERAMIC	C-49	THRU C-51 1000; GP, CERAMIC
C-3	25; GP, CERAMIC	C-22	2.7; QC, CERAMIC	C-52	THRU C-53 0.25μF; METALITE, 200V
C-4	20; GP, CERAMIC	C-23	4 TO 30 TRIMMER, CERAMIC	C-54	1000; FEED THRU
C-5	& C-6 2000; MICA, SILVER	C-24	1000; FEED THRU	C-55	& C-56 1000; GP, CERAMIC
C-7	0.01μF; DISC, CERAMIC	C-25	300; MICA, SILVER	C-57	& C-58 0.25μF; METALITE, 200V
C-8	0.02μF; DISC, CERAMIC	C-26	0.02μF; DISC, CERAMIC	C-59	100; MICA, SILVER
C-9	0.25μF; PAPER, 400V	C-27	& C-28 3.9; QC, CERAMIC	C-60	33; GP, CERAMIC
C-10	91; MICA, SILVER	C-29	A & B; 3 TO 22.5 TUNING OSC, CW	C-61	390; MICA, SILVER
C-11	A & B; 20 X 20, ELECTROLYTIC	C-30	THRU C-32 0.01μF; DISC, CERAMIC	C-62	& C-63 0.02μF; DISC, CERAMIC
C-12	A & B; 1 TO 8 TUNING, OSC-SWEEP	C-33	400; MICA, SILVER	C-64	1000; FEED THRU
C-13	& C-14 20; GP, CERAMIC	C-34	& C-35 25μF; ELECTROLYTIC, 25V	C-65	1.5 TO 7 TRIMMER, CERAMIC
C-15	1000; FEED THRU	C-36	400; MICA, SILVER	C-66	5000; DISC, CERAMIC
C-16	2.7; QC, CERAMIC	C-37	& C-38 1000; FEED THRU	C-67	THRU C-77 1000; FEED THRU
C-17	0.25μF; PAPER, 400V	C-39	THRU C-45 8.2; GP, CERAMIC	C-78	THRU C-81 8.2; GP, CERAMIC
C-18	25μF; ELECTROLYTIC, 25V	C-46	400; MICA, SILVER		

*FACTORY SELECTED AT TIME OF TEST.

Coils:

L-1 PLATE LOAD, SATURABLE REACTOR
L-2 A & B; SPECIAL, BAND 1 SWEEP OSC.
L-3 A & B; " " 2 " "
L-4 A & B; " " 3 " "
L-5 A & B; " " 4 " "
L-6 A & B; " " 5 " "
L-7 A & B; " " 6 " "
L-8 SPECIAL, AUDIO SHAPING
L-9 A & B; SPECIAL BAND 1 CW OSC.
L-10 A & B; " " 2 " "
L-11 A & B; " " 3 " "
L-12 A & B; " " 4 " "
L-13 A & B; " " 5 " "
L-14 A & B; " " 6 " "
L-15 12 MICROHENRY CHOKE, FILAMENT
L-16 THRU L-22 SPECIAL TUNING
L-23 THRU L-26 AS REQUIRED (SPECIAL TUNING)
L-27 12 MICROHENRY CHOKE FILAMENT

Switches:

S-1 ROTARY, TURRET, AND WAFERS, 6 POSITION
A. TURRET, TUNING
B. MARKER SELECTOR
C. SWEEP CENTERING
D. SWEEP WIDTH
S-2 ROTARY, TURRET, 6 POSITION CW MARKER
S-3 THRU S-5 TOGGLE, KAY SPECIAL DPDT ATTENUATOR
S-6 THRU S-12 TOGGLE, CARLING MODIFIED SPDT CRYSTAL MARKER
S-13 THRU S-16 AS REQUIRED CARLING MODIFIED SPDT CRYSTAL MARKER
S-17 TOGGLE, CARLING SPST, POWER ON-OFF (AC)
S-18 TOGGLE, CARLING DPST, STAND-BY (DC)

Diodes:

D-1 THRU D-4 HIGH FREQUENCY, 1N294
D-5 & D-6 HIGH FREQUENCY, GE-G7C
D-7 THRU D-10 HIGH FREQUENCY, 1N294

Miscellaneous:

I-1 THRU I-4 PILOT LAMP; BAYONET, MAZDA, #47
J-1 GRC CONNECTOR, SWEEP OUTPUT
J-2 IPC CONNECTOR, SWEEP OSC OUTPUT
J-3 GRC CONNECTOR, PIP OUTPUT
P-1 PLUG; JONES P-308-CCT, 8 PRONG
P-2 PLUG; JONES P-302-CCT, 2 PRONG
Y-1 THRU Y-7 (Y-11) QUARTZ CRYSTAL MARKER; AS REQUIRED

ADDENDUM (865AW ONLY, *KD-5427-E*)

R-156 THRU R-158 FACTORY SELECTED
R-159 270K
R-160 2.7K
R-161 4.7K
R-162 220K
R-163 3.3K
R-164 6.8K
R-165 2.2M
R-166 560K
R-167 220K

C-38 THRU C-45 NOT USED
C-47 NOT USED
C-78 THRU C-81 NOT USED
C-82 10μF; ELECTROLYTIC, TUBULAR, 150V
C-83 THRU C-85 0.5μF; METALIZED PAPER, 200V
C-86 0.1μF; DISC, CERAMIC, 75V
C-87 & C-88 1000; FEED THRU

D-11 THRU D-14 DIODES, HIGH FREQUENCY, 1N294

J-4 GRC CONNECTOR, SCOPE
J-5 IPC CONNECTOR, DETECTOR INPUT

L-28 THRU L-32 COILS, AS REQUIRED (SPECIAL TUNING)

S-6 THRU S-16 NOT USED
S-19 SWITCH, ROTARY, 6 POSITION, 2 WAFER, CRYSTAL GROUP SELECTOR

V-15 TUBE, 12AT7, CATHODE FOLLOWER

Y-1 THRU Y-16 QUARTZ CRYSTAL MARKERS AS REQUIRED

REV/580624/EAA

SECTION VII
200 ASM POWER SUPPLY

A. DESCRIPTION.

Power Supply No. 200 ASM is a regulated d-c voltage supply with output voltage adjustable between 225 and 275 volts. The unit operates from a 117V, 60 cps power source. Constructed on an individual chassis, the supply is a completely self-contained unit designed for operation in conjunction with a test instrument requiring a highly stable d-c voltage source. The supply is normally enclosed in the same cabinet housing the associated r-f circuitry.

B. POWER SUPPLY CIRCUIT DETAILS.

This regulated power supply furnishes all filament and d-c power required by the r-f circuits of the test equipment.

1. **Rectifier Circuit.** High voltage is supplied from the secondary of *T-1* to the conventional full wave rectifier diodes. The rectified output voltage is filtered by *C-1*, *L-1* and *C-2* and fed to the voltage regulator circuits.

2. **Voltage Regulator Circuit.** The filtered d-c voltage from *D-1* to *D-6* is fed through a regulating circuit comprising *V-1*, *V-2* & *V-3* to the output terminal. *V-1*, *V-2* and *V-3* are effectively connected in parallel and function as a variable series resistance to control the output voltage. The remaining stages in the power supply *(V-4, V-5, V-6, V-7)* detect and amplify any significant output voltage changes and feed them to the control stage. They function in the following manner:

Condenser *C-3* and regulator tube *V-7* transmit variations in the B+ output to the grid of tube *V-5*. This tube, its cathode potential regulated by *V-6*, then draws a greater or lesser plate current, an increase in plate current, causing corresponding plate voltage fluctuations. These fluctuations are transmitted through the cathode follower *V-4* to the grids of the passage tubes *V-1*, *V-2* and *V-3*, where they correct the original variations in the B+ output.

Since *R-12* is also the bias resistor for the control tubes, *V-1*, *V-2* and *V-3*, their plate to cathode resistance decreases, thereby lowering the power supply's output voltage.

For a decrease in output voltage, the controlling action described above is reversed. *R-16* provides an output voltage adjustment for initially setting the d-c output voltage to the required value.

C. MAINTENANCE.

1. **Voltage Adjustment.** The setting of *R-16* determines the d-c voltage output of the power supply. To adjust *R-16*, connect a d-c voltmeter at the B+ terminals on the associated equipment; with all power on and power supply under full load, set *R-16* to the required voltage input for the associated equipment.

2. **Trouble Location.** The following chart should aid in locating troubles in the power supply.

SYMPTOM	PROBABLE CAUSE AND CORRECTION
ZERO OUTPUT VOLTAGE FROM POWER SUPPLY; NO HEATERS LIGHT.	CHECK FUSE; IF BLOWN, CHECK C-1 AND C-2 FOR SHORT BEFORE REPLACING. ALSO CHECK D-1 TO D-6 FOR SHORT. CHECK A-C WIRING; CHECK T-1 AND L-1.
ZERO OUTPUT VOLTAGE, ALL TUBES LIGHT.	CHECK D-1 TO D-6. CHECK C-2, C-5 AND C-4 FOR SHORTS. CHECK FOR OPEN HV WINDING ON T-1; CHECK ASSOCIATED EQUIPMENT FOR B+ SHORT.
LOW OUTPUT VOLTAGE; POORLY REGULATED.	CHECK TUBES V-1, V-2, V-3, V-4, V-5, V-6 AND V-7. CHECK C-3 AND C-6 FOR SHORTS. CHECK R-16 AND R-15.
VOLTAGE OUTPUT HIGHER THAN NORMAL. POOR REGULATION.	CHECK V-7. OPEN R-16. CHECK TUBES V-4, V-5 AND V-6.
EXCESSIVE RIPPLE IN D-C OUTPUT.	CHECK C-1 AND C-2. CHECK FOR EXCESSIVE LOAD ON SUPPLY.

D. 200 ASM POWER SUPPLY PARTS LIST.

CAPACITORS:

C-1	6μF, 600V, OIL-FILLED
C-2	2μF, 600V, OIL-FILLED
C-3	0.1μF, 400V, PAPER
C-4	A & B, DUAL ELECTROLYTIC, 2 x 20μF, 450V
C-5	0.01μF, 500V, CERAMIC DISC
C-6	1000μμF, 500V, CERAMIC

RESISTORS:

R-1	330 K, 1 W	R-9	100, 1 W
R-2	33, 1 W	R-10	100, 1 W
R-3	100, 1 W	R-11	270 K, ½ W
R-4	33, 1 W	R-12	150 K, 1 W
R-5	100, 1 W	R-13	3.3 K, 1 W
R-6	33, 1 W	R-14	5.6 K, 2 W
R-7	100, 1 W	R-15	47K, ½ W
R-8	100, 1 W	R-16	50 K, POT B^+ ADJ.
		R-17	330 K, 1 W

SILICON RECTIFIERS:

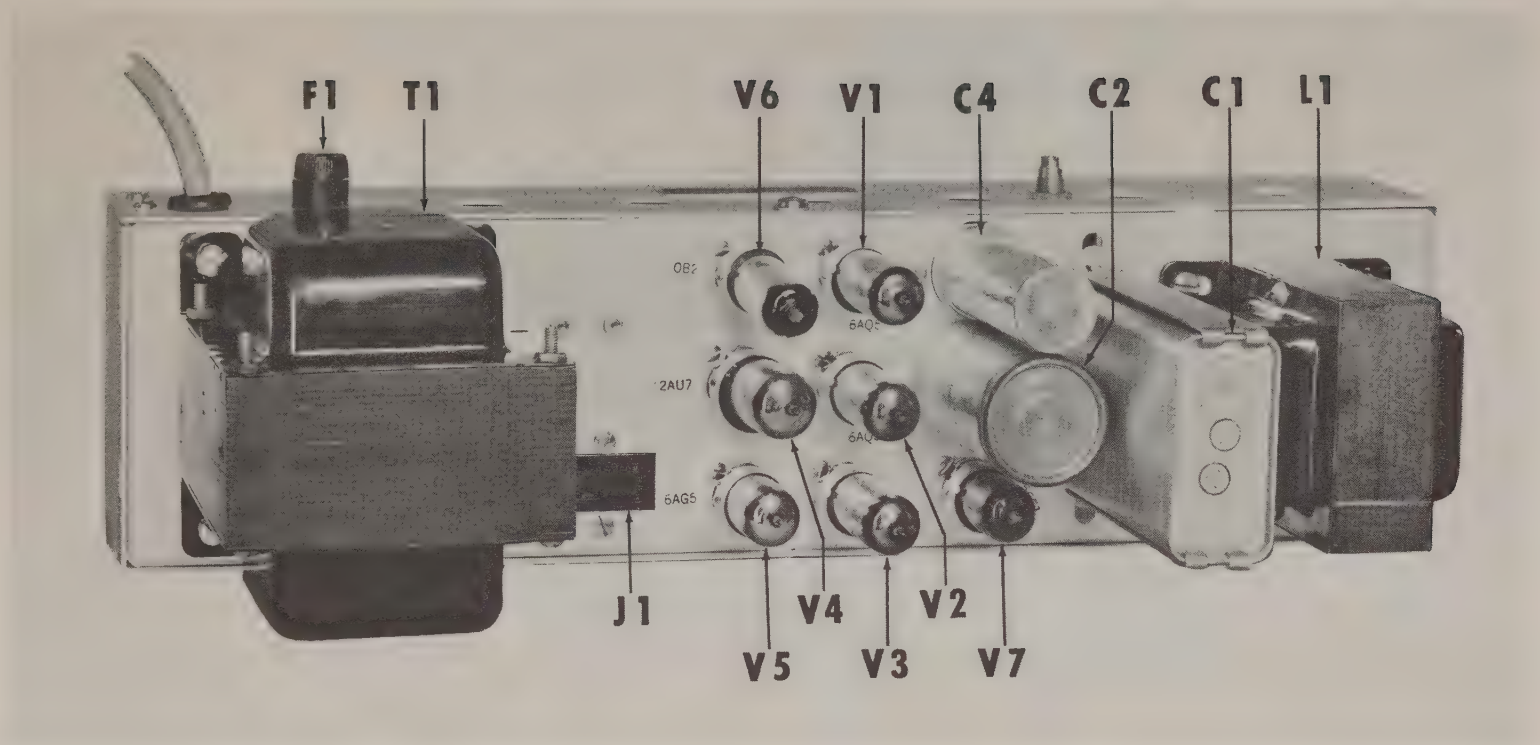
D-1	M-500
D-2	M-500
D-3	M-500
D-4	M-500
D-5	M-500
D-6	M-500

TUBES:

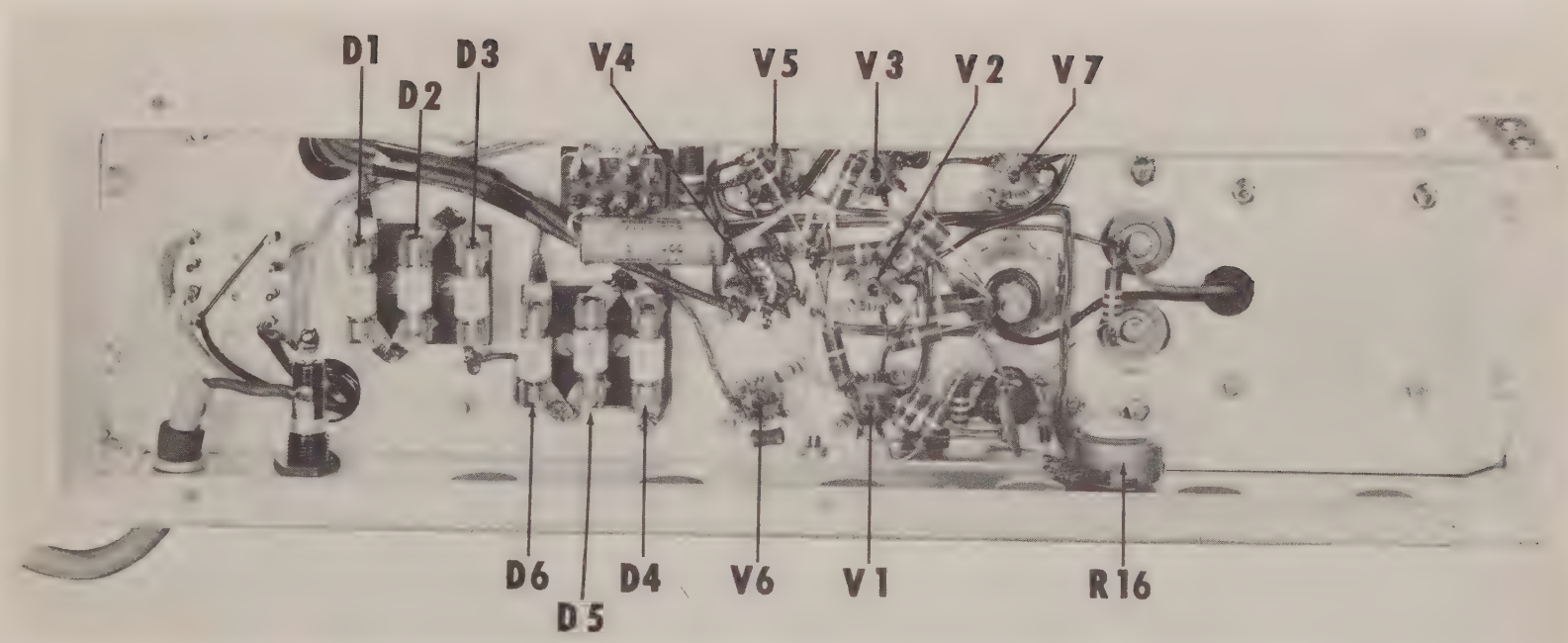
V-1	6AQ5
V-2	6AQ5
V-3	6AQ5
V-4	12AU7
V-5	6AG5
V-6	OB2
V-7	5651

MISCELLANEOUS:

F-1	3A, 250V, FUSE
J-1	JONES S-306-AB
L-1	8 HY, KAY #5501
P-1	AC LINE CORD
T-1	POWER TRANSFORMER, KAY #5361



200 ASM Power Supply Component Location, Top of Chassis



200 ASM Power Supply Component Location, Bottom of Chassis

Voltage & Resistance Readings

VOLTAGE READINGS

NO.	TUBE	PIN #1	PIN #2	PIN #3	PIN #4	PIN #5	PIN #6	PIN #7	PIN #8	PIN #9
V-1	6AQ5	250V	260V	*6.3VAC	*6.3VAC	425V	425V	250V		
V-2	6AQ5	250V	260V	*6.3VAC	*6.3VAC	425V	425V	----		
V-3	6AQ5	250V	260V	*6.3VAC	*6.3VAC	425V	425V	----		
V-4	12AU7	425V	245V	250V	*6.3VAC	*6.3VAC	440V	245V	250V	*6.3VAC
V-5	6AG5	100V	105V	*6.3VAC	*6.3VAC	245V	185V	105V		
V-6	OB2	----	----	----	----	105V	----	----		
V-7	5651	250V	----	----	----	----	----	170V		

VOLTAGE READINGS TAKEN WITH STANDBY (S-15) SWITCH ON.

*VOLTAGE READINGS TAKEN ACROSS FILAMENTS.

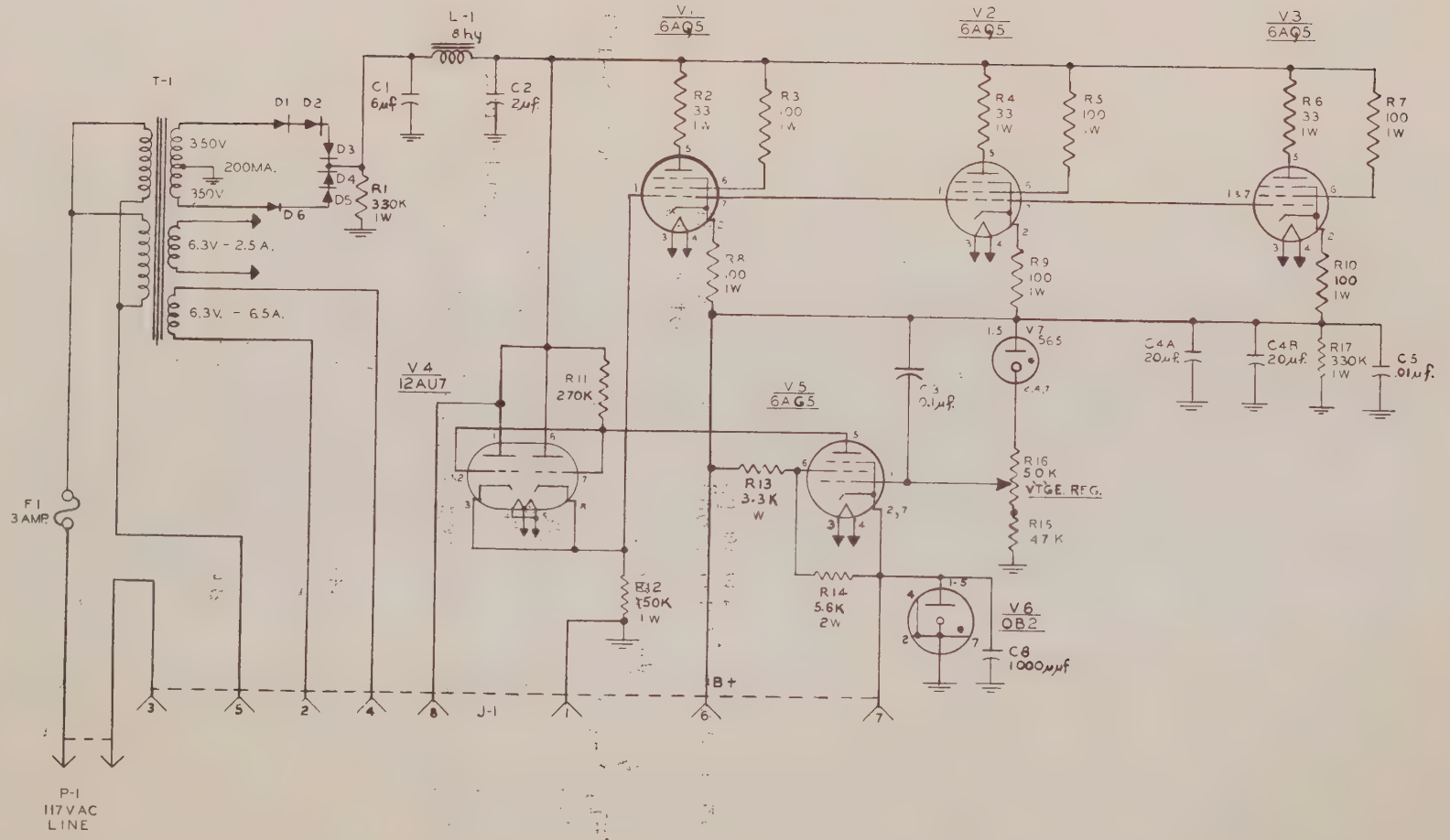
RESISTANCE READINGS

V-1	6AG5	150K	450K	----	----	260K	260K	150K		
V-2	6AG5	150K	450K	----	----	260K	260K	----		
V-3	6AG5	150K	450K	----	----	260K	260K	----		
V-4	12AU7	260K	550K	150K	----	----	260K	550K	150K	----
V-5	6AG5	58K	325K	----	----	550K	325K	325K		
V-6	OB2	----	----	----	----	325K	----	----		
V-7	5651	325K	----	----	----	----	----	100K		

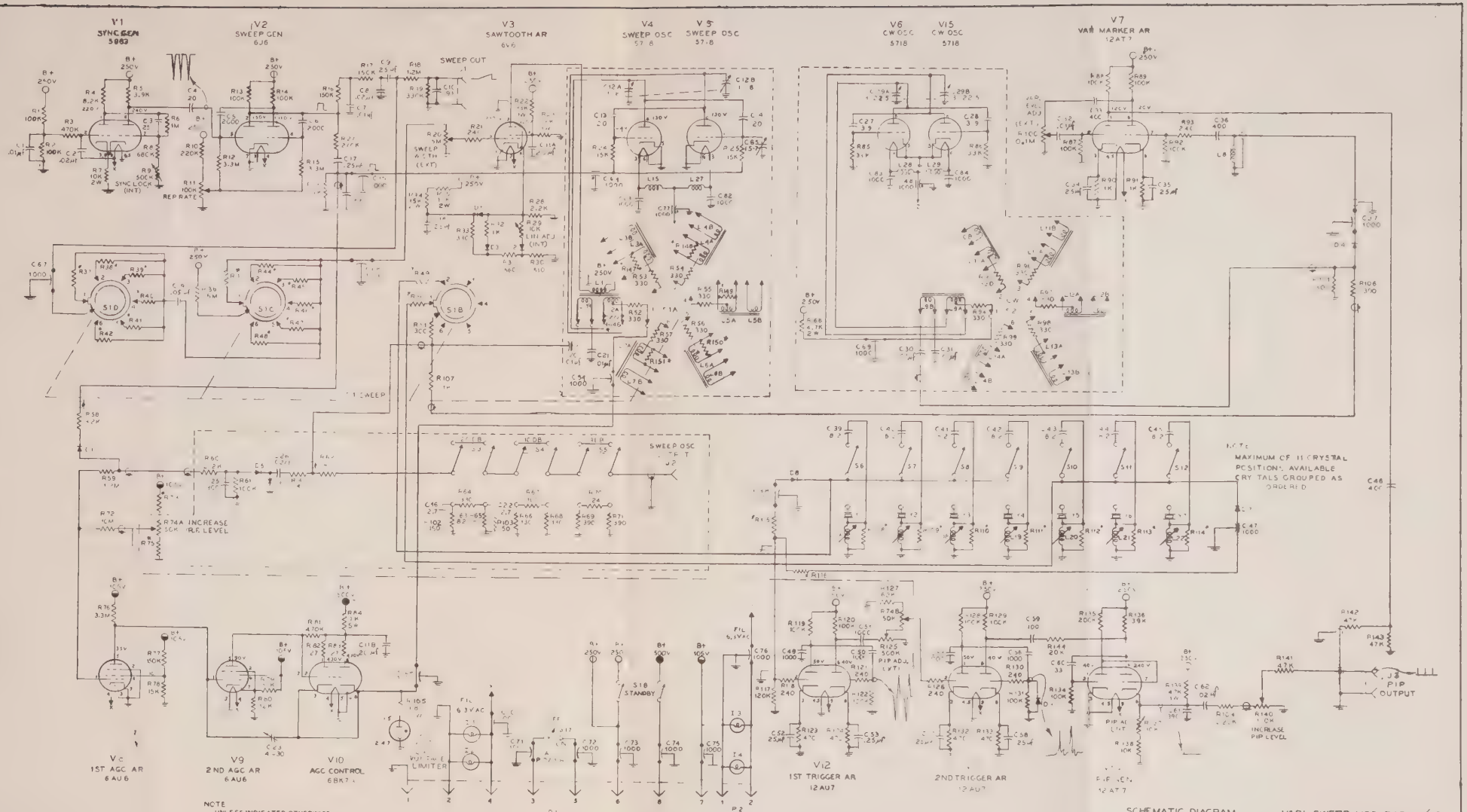
RESISTANCE READINGS TAKEN WITH POWER SUPPLY DISCONNECTED FROM UNIT.

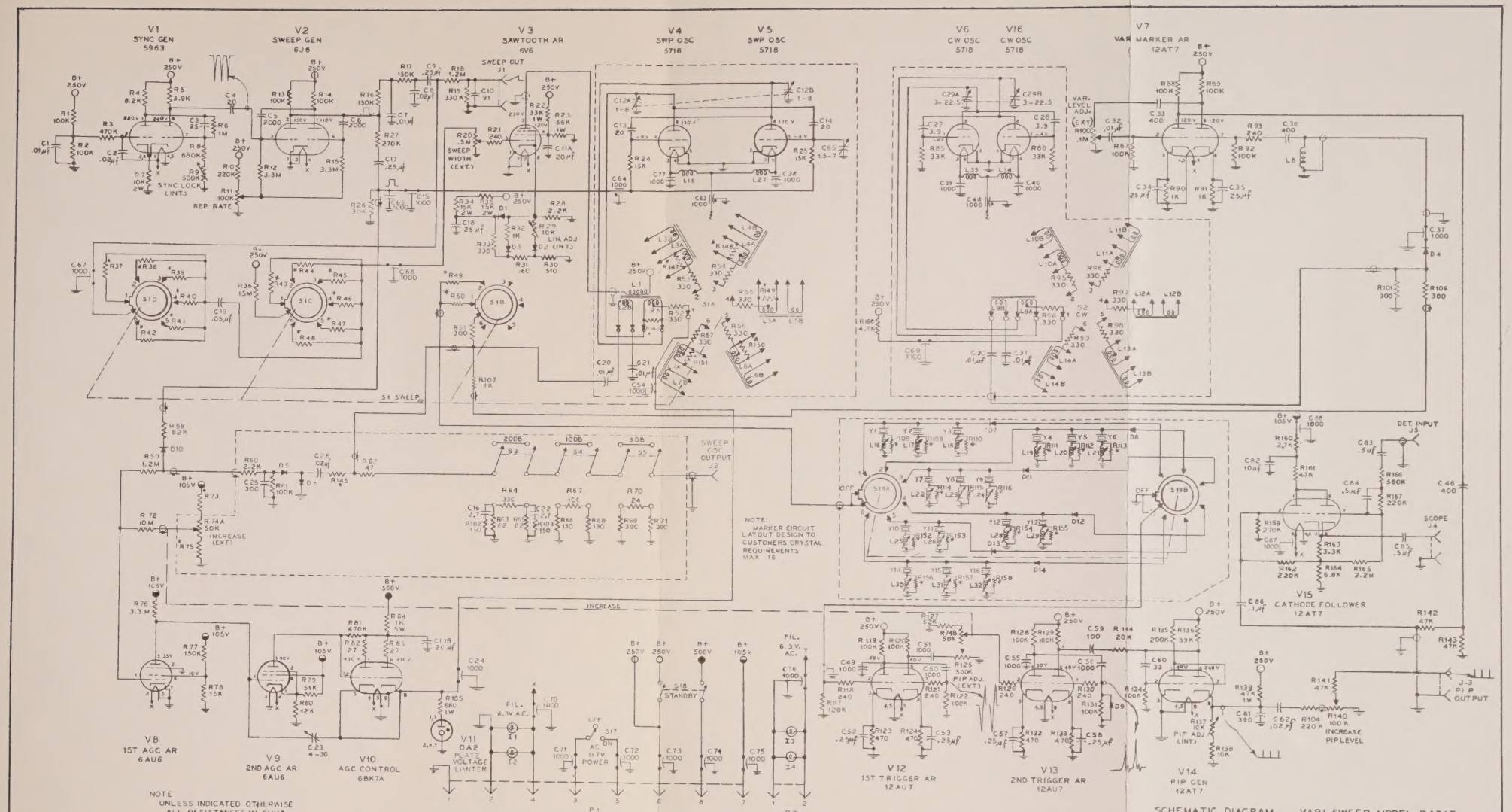
Statement above - "Voltage readings taken with Standby (S-15) switch on" - does not apply.

Tubes V-1, V-2 & V-3 under Resistance Readings should read 6AQ5



200 ASM Power Supply Schematic, KB-5456-C

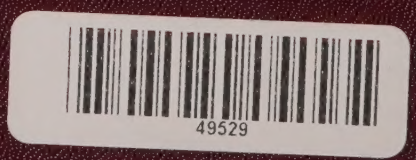

V1
SYNC GEN
5963
V2
SWEEP GEN
6J6
V3
SAWTOOTH AR
6X8
V4
SWEEP OSC
5718
V5
SWEEP OSC
5718
V6
CW OSC
5718
V15
CW OSC
5718
V7
VAR MARKER AR
12AT7
SWEEP CUT
SYNC LOCK (INT)
REP RATE
SWEEP WIDTH (EXT)
SWEEP WIDTH ADJ (INT)
INCREASE R.F. LEVEL
SWEEP OSC FREQ
MAXIMUM OF 11 CRYSTAL POSITIONS AVAILABLE CRYSTALS GROUPED AS ORDERED
S1A
S1B
S1C
S1D
S2
S3
S4
S5
S6
S7
S8
S9
S10
S11
S12
S13
S14
S15
S16
S17
S18
STANDBY
PIP ADJ.
PIP OUTPUT
INCREASE PIP LEVEL
V8
1ST AGC AR
6AU6
V9
2ND AGC AR
6AU6
V10
AGC CONTROL
6BK7
V11
1ST TRIGGER AR
12AU7
2ND TRIGGER AR
12AU7
V12
V13
V14
VOLTAGE LIMITER
NOTE
UNLESS INDICATED OTHERWISE
ALL RESISTANCES ARE IN OHMS
ALL CAPACITANCES ARE IN μμf
FACTORY SELECTED
SCHEMATIC DIAGRAM
VARI-SWEEP MOD. RADAR & IF



SCHEMATIC DIAGRAM VARI-SWEEP MODEL RADAR

MODEL 865-AW

FIG. 8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